Photoconductivity Studies of Treated CdSe Quantum Dot Films Exhibiting Increased Exciton Ionization Efficiency

VENDA PORTER, MIRNA JAROSZ, BRENT FISHER, Department of Chemistry and Center for Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, MA, MARC KASTNER, Department of Physics, Massachusetts Institute of Technology, Cambridge, MA, MOUNGI BAWENDI, Department of Chemistry and Center for Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, MA — We present a photocurrent study of CdSe quantum dot films exhibiting unity internal quantum efficiency as a result of post-deposition treatments. While the photocurrent of untreated films is highly voltage dependent at all voltages, the treated films depend strongly on voltage at low voltage, linearly with voltage above a voltage threshold, and finally saturate at high voltage. The voltage dependence of the treated films can be reproduced with a model assuming blocking contacts and a field dependent exciton ionization efficiency that saturates to unity. The increase in exciton ionization efficiency is a result of increased surface passivation and decreased QD spacing.